"CRAB ORCHARD CHERT": A GEOLOGICAL MISNOMER

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Abstract.- "Crab Orchard Chert" consists of silicified fossil Ordovician stromatoporoid bodies locally utilized during prehistoric times in central Kentucky. The occurrences are actually in the Ordovician Reba limestone rather than the Silurian Crab Orchard Formation. Distinguishing various stromatoporoidal "cherts" based upon stromatoporoid taxonomy is feasible in some cases but is inhibited by the reluctance of paleontologists to study material in which silicification has destroyed much of the structure and which requires thin-section preparation. The distribution of silicified stromatporoids has also been neglected by most field geologists and ignored by archaeologists.

Introduction.-"Crab Orchard Chert" was originally described as a "provisional type" by DeRegnaucourt and Georgiady (1988) from the Silurian Crab Orchard Formation of Garrard Co., Kentucky. It is further described in Deregnaucourt (2001) but mistakenly identified as Devonian in age. Because of the pronounced wavy, zig-zag, or "crimped" pattern it often displays, this material is very distinctive. Although "Crab Orchard chert" is limited to the area of Paint Lick and Lancaster, in Garrard County, Kentucky, very similar materials occur in Ordovician and Devonian rocks of Tennessee, Ohio, and New York, and may be expected elsewhere.

The present study was initially undertaken because flint or chert has nowhere else been reported from Crab Orchard strata. A visit to the type locality on the Walker-Noe Farm near Paint Lick (Fig. 1) revealed that "Crab Orchard Chert" actually consists of float fragments of silicified fossil stromatoporoid colonies weathered from the Reba Member of the Upper Ordovician Ashlock Formation (Fig. 2). At the Walker-Noe farm, silicified stromatoporoid bodies occur mainly between elevations of 990-1010' A.M.S.L. along a small tributary of Walker Run and, along with utilized material, in cultivated fields immediately to the south, where the mottled, banded gray material is mixed with abundant brightly-colored flint derived from outcrops of Boyle Dolomite occurring about 80 feet higher. The intervening bedrock is of poorly exposed dolomitic shales of the upper Ordovician Drakes Formation and the Silurian Crab Orchard Formation, neither of which contains any flint or chert.

Stromatoporoids.- Stromatoporoids are extinct, sponge-like invertebrate organisms with non-spiculate, calcareous basal skeletons of laminar, domical, bulbous, branching to columnar form; internally composed of regular, continuous network of growth parallel and normal to growth skeletal elements, either interconnected laminae, or cyst plates, and pillars. They are limited to Ordovician through Devonian marine strata. "Stroms" are often poorly preserved due to replacement of the original high-magnesium calcite and aragonite by low-magnesium calcite and even silica. (Stearn et al. 1999).

Identification even at the generic level usually requires microscopic study of thin sections. Figure 3, taken from Galloway and St. Jean (1961), illustrates vertical and tangential cross sections of the two most common genera found in the middle Ordovician of central Kentucky, *Labechia* (1A, 1B) and *Stromatoceplum* (2A, 2B). Unfortunately, because silicification often destroys the finer structures of stromatoporoids, silicified examples have not received any study by paleontologists; for that matter, stratigraphers and general geologists often pay little attention to the occurrence of stromatoporoids unless they are abundant enough to form large, reef-like masses. Conversation with Kentucky geologists has not revealed any recollection of seeing silicified stromatoporoids in the field, and stromatoporoid specialists have been reluctant to study the available material, although much of it does preserve stromatoporoid microstructure.

Silicified Stromatoporoids in Kentucky. - The Reba limestone member of the upper Ashlock Formation ranges from 10 to 25 feet thick. It has been found from near Stanford to near Winchester and was previously referred to as the Arnheim Formation of Ohio, a stratigraphic term no longer used (Weir, Greene, and Simmons 1965).

Silicified stromatoporoids have been located in situ in the Reba Member as far west as Lancaster, Garrard Co. They have also been found in a new roadcut at Point Leavall, ca. 5 km northwest of the Walker-Noe outcrop. The Reba Member intergrades eastward into beds of the Bull Fork Formation and southward into the Cumberland Formation, and silicified stromatoporoids have not been found in outcrops of those rocks, although thin stringers of chert have been noted in the Cumberland Formation near Burkesville, Kentucky, and unsilicified stromatoporoids occur in the Sunset Member of the Bull Fork Formation.

Silicified stromatoporoids have also been found near Danville, Boyle Co., in the Middle Ordovician Tanglewood Member of the Lexington Formation where the largest known silicified Kentucky examples occur. These have been tentatively identified as Stromatocerium, although unsilicified stromatoporoid bodies abundant in the Strodes Creek, Stamping Ground, and Tanglewood members of the Lexington Limestone, where they are sometimes very conspicuous (Fig. 4), have generally been referred to as *Labechia*. The geographic extent of silicified material is currently very poorly known, but since it clearly occurs in more than one stratigraphic unit, this material should probably be referred to as "Kentucky stromatoporoid chert" or "Ordovician stromatoporoid chert" unless there is a clear reason to believe the material came from a particular stratigraphic unit. The term "Crab Orchard Chert" is a geological misnomer, is definitely misleading, and should not be used.

Confusion with Tyrone and Other Kentucky Banded Cherts.- It appears that the stromatoporoid chert of central Kentucky has been confused with banded chert from the older Ordovician Tyrone Limestone and with banded Mississippian cherts of the Meade Co. area. Thin bedded and nodular banded chert is common in the Ordovician Tyrone limestone, often associated with siliceous pyrolitic bentonite ash beds, and local collectors frequently refer to banded chert artifacts found in the area along the Kentucky River north of Garrard County as "Tyrone chert," even if it exhibits fossilized stromatoporoid structure. The Tyrone has been examined at the type locality in and near the quarry at Tyrone, Anderson County, about five miles west of Versailles, and in the High Bridge section near Boonesborough. At Tyrone, nodular and thin-bedded banded chert is abundant but generally too fractured to have been widely utilized for artifact material. It is possible that suitable material may occur elsewhere in the Tyrone and have been carried downstream along the Kentucky River, but this remains to be established. Finely banded nodular chert is also common in Mississippian limestones in Meade County, across the Ohio River from the better known "Harrison County" or Wyandot chert of Indiana. Lacking fossil evidence, these Ordovician and Mississippian cherts can easily be confused with one another, but all of them lack the zig-zag pattern created by stromatoporoid mamelons as well as the finer cellular structure of stromatoporoid bodies. Artifacts manufactured from Garrard Co. silicified stroinatoporoids are

very distinctive and cannot be easily confused with material from Tyrone or Meade Co. strata (Figs. 5, 6).

Silicified Stromatoporoids in Tennessee.- To complicate matters further, silicified stromatoporoids are also abundant in central Tennessee, particularly along the Cumberland and Duck Rivers, where the material was utilized in prehistoric times as well as the present. Bassler (1932) and Wilson (1948) provide data on numerous occurrences of silicified stromatoporoids in middle and upper Ordovician rocks of central Kentucky, and this material is familiar to Tennessee archaeologists as "sponge chert." Amick (1987), following Faulkner and McCollough (1973) and McCollough and Faulkner (1976) provides a good description of its occurrence in the Ordovician Bigby-Cannon limestone of central Duck River Basin but like his predecessors failed to realize the organic nature of its origin, referring to it simply as "gray-banded" or "brown-banded" chert. Faulkner and McCullough's Shelton Quarry site (40BD80), a half-mile below the Normandy Reservoir dam, has been visited and very dark but typical stromatoporoidal chert collected (Fig. 7).

Silicified Stromatoporoids in New York and Ohio.- Silicified stromatoporoids and bedded black chert have been described from dolomite in the Martisco Reef Complex of Cobleskill age near Marcellus Falls, New York (Ciurca 2003). Stromatoporoids are common in Ordovician, Silurian and Devonian rocks of Ohio but silicified examples have not been reported. Although Ordovician and Silurian examples are relatively small, massive stromatoporoids (Anostylostroma) up to 20 cm. in diameter are common in the Devonian limestones of central and northwestern Ohio and might be available in glacial drift (Keller 1963). One end scraper of this material has been noted in a collection from the Crawford County area. The finely spaced, broad, even laminae are quite distinctive and such material cannot be confused with Kentucky Ordovician stromatoporoids.

Conclusions.- The term "Crab Orchard chert" is based upon a stratigraphic misidentification and should not be used. Lithic material derived from silicified stromatoporoids in the Reba limestone of Garrard Co., Kentucky is macroscopically indistinguishable from similar material along the Cumberland River in north central Tennessee. Further field work is necessary to determine the extent of silicified stromatoporoid occurrences in Kentucky and Tennessee, while detailed paleontological study is necessary to determine whether distinct species characterize the different stratigraphic occurrences.

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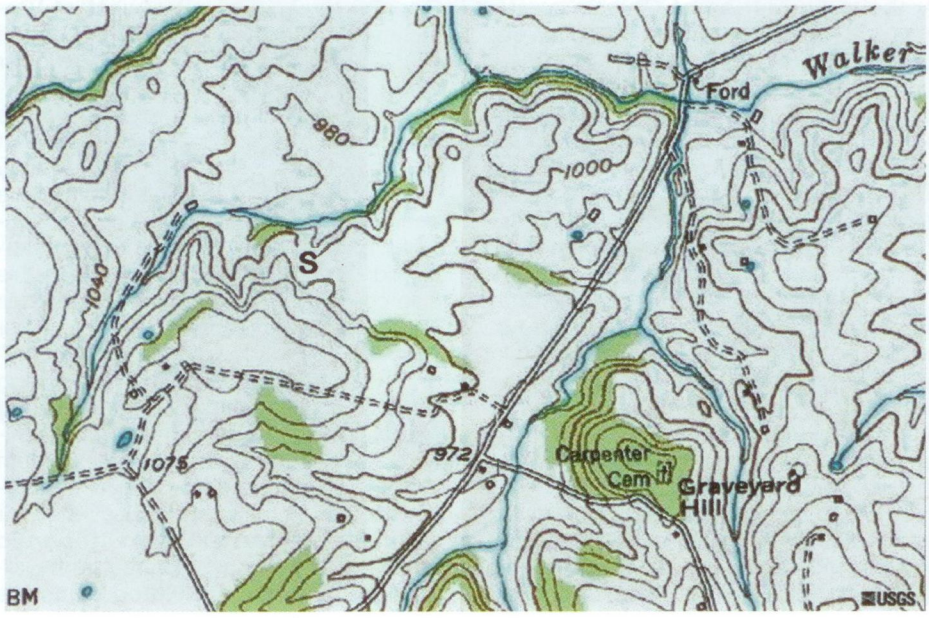

Figure 1. (Murphy) Portion of Paint Lick, Kentucky, 7½' U. S. G. S. Quadrangle showing location of stromatporoid occurrence (S) on Walker-Noe farm.

Figure 2. (Murphy) Natural cross-section of silicified stromatoporoid from Walker-Noe farm near Paint Lick, Garrard Co., Kentucky.

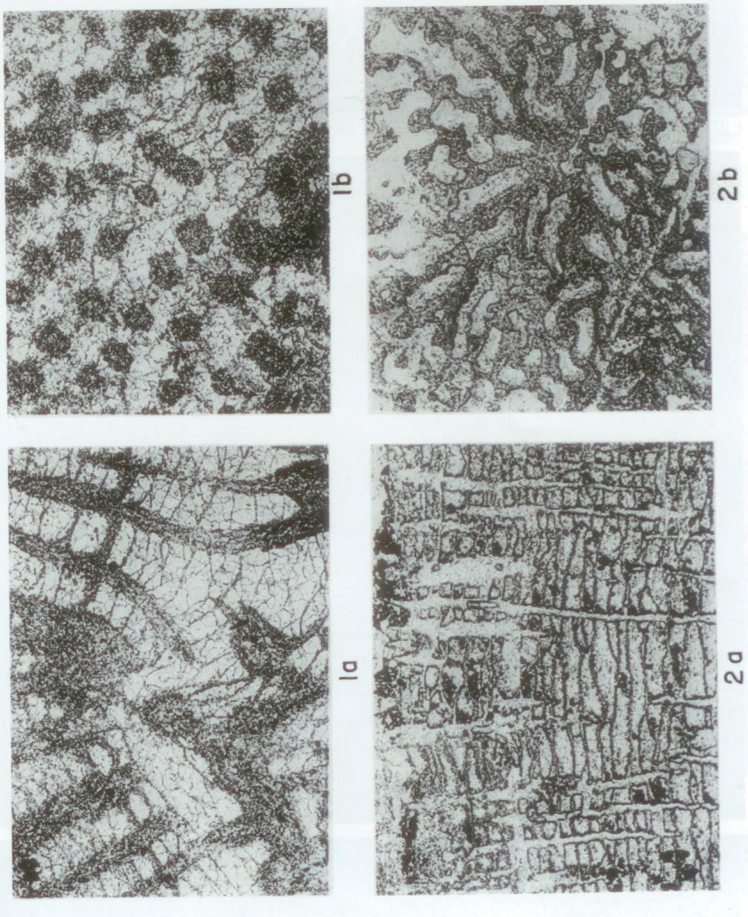

Figure 3. (Murphy) Microscopic vertical and tangential cross sections of Labechia (1 a-b) and Stromatocerium (2a-b) illustrating structure (From Galloway and St. Jean 1961).

Figure 4. (Murphy) Large unsilicified Labechia stromatoporoid bodies in the Lexington limestone exposed in roadcut near Lexington, Kentucky.

Fig. 5. (Murphy) Bifaces of Kentucky silicified stromatoporoid material from Garrard Co., Kentucky. Randall Carrier Collection.

Fig. 6. (Murphy) Additional bifaces of Kentucky silicified stromatoporoid material from Garrard Co., Kentucky. Randall Carrier Collection.

Fig. 7. (Murphy) Fragments of Faulkner and McCollough's "gray-banded chert" from the Shelton Quarry Site. Silicified stromatoporoids from the Bigby-Cannon Limestone along Duck Creek below the Normandy Reservoir Dam, Bedford Co., Tennessee.